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# SOIL CONSERVATION PAYS OFF

Results of Ten Years of  
Conservation Farming  
in Illinois

By E. L. Sauer  
and H. C. M. Case

**Bulletin 575**

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A number of the photographs used in this publication were supplied by W. F. Purnell.

# SOIL CONSERVATION PAYS OFF

By E. L. SAUER and H. C. M. CASE<sup>1</sup>

**S**OIL-CONSERVATION measures have for their purpose the protection of agricultural land while it is being used productively. A soil-conservation plan for a farm usually includes measures that will not only build up current productivity but will also give protection for future years.

In fact, the real test of a plan is the *long-time* gain it will cause in the productive capacity of the land. Many farmers who recognize in general the need for soil conservation, have some very practical questions: Will I be able to obtain satisfactory earnings while putting the plan into operation? Are the benefits worth the trouble and expense of the program? Can I afford to cut down acreages in grain and increase the area of hay and pasture?

The study reported here aims to help answer these questions, not only for farmers but also for those whose job it is to help farmers work out their conservation plans.

“Conservation,” as used in this bulletin, includes the use of land in accordance with its capabilities; the use of practices that will lessen or prevent harmful soil erosion and water runoff, and improve drainage; and the maintenance or improvement of soil fertility and productivity.

Many farmers are interested in conservation as a means of securing large future incomes; almost all farmers are interested in securing high production and optimum farm income in the near future. There is, however, no major conflict between these two interests of farmers. True, many present farming programs need to be changed, and the necessary changes usually require the outlay of some capital and may also cause a temporary reduction in current income. But this will soon be more than offset by increased production and income.

Landlords and tenant farmers both too frequently overemphasize quick returns. The landlords who do this, however, often find their income reduced in later years because of either temporary or permanent damage to their farms. Tenants, too, will find their ability to

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succeed as farmers and to rent highly productive farms will depend more and more upon their acceptance of systems of farming that insure long-time high production from the land.

**Problems in working out a conservation plan.** Anyone working out a conservation plan for his farm needs to distinguish between reduced fertility that has resulted from long-continued cropping and deterioration that comes as the soil erodes away. Reduced fertility can be remedied by applying proper fertilizers; but to control erosion may call for a shift in the use of the land, for changes in rotation, and for better disposal of surplus water.

On sloping land some run-off is likely to occur under any cropping system. If the topsoil is deep and the subsoil is productive, this slight erosion may not be serious. But on soils where much of the topsoil is gone and the subsoil cannot be made productive, an effective means of controlling erosion has to be developed. This may mean adopting cropping systems that cover the land with sod crops most of the time, and building terraces and controlling waterways to help hold the soil in place while it is in crops. The cropping plan on many farms must include a generous amount of grass and legumes. With an increase in these crops, a farmer often has to make some marked change in his general system of farming. Often he has to keep more roughage-consuming animals in order to dispose of these crops profitably.

Much of the land in Illinois is owned by people who do not operate it. In order to carry out sound soil-conservation plans on tenant-operated farms when the land is subject to harmful erosion, it is necessary for tenants and landlords to agree on a program of proper land use. Owners and tenants alike have a responsibility to society to prevent the deterioration of soil resources which cannot be replaced.



Terraces built with a farm tractor and plow on sloping Saybrook type soil in McLean county prevent further sheet erosion. (Fig. 1)

**The test of conservation benefits.** The real test of soil and water conservation practices is their effect on crop yields, total farm production, and farm earnings. Some practices will result in immediate returns while other practices may not show their true benefits for several years. Land that has been badly eroded and depleted will require heavy expenditures of labor and capital to make it highly productive. The major gain over a long period is the increased productivity of the land over that of land that has received no special care to prevent the permanent deterioration of the soil.

## Plan of Study

To answer some of the many questions regarding the economic feasibility of soil and water conservation and erosion control, studies were started in three areas of Illinois in 1936 to 1940: in McLean county in 1936; in Madison and St. Clair counties in 1939; and in Stephenson, Jo Daviess, and Winnebago counties in 1940. The intent of these studies was to measure the effect of soil and water conservation on crop and livestock production and on farm incomes over a period of years. Data were obtained from farm-account records concerning production, conservation, and other operating costs and incomes on sample farms similar in land-use capabilities but differing in the extent that soil and water-conservation practices were used.

A soil-conservation score was computed for each farm on the basis of number and extensiveness of conservation practices used. Farms with conservation plans that included a large percentage of conservation practices were "paired" with physically comparable farms without well-developed conservation plans. Size, type of production, soil type, tendency to erosion, and topography were considered.

Farms with conservation plans and scoring high were labeled "high-conservation farms." Those that had no or inadequate plans and scored low were labeled "low-conservation farms." Results for both groups of farms are described in this bulletin.

All expense and income figures used in this study are based on 1945 prices since they represent a conservative long-time level.

**McLean county**, where the first study was begun in 1936, is in the heart of the Illinois corn belt in what is known as the cash-grain area of the state. Corn, soybeans, and oats are the major grain crops, and grain sales are a major source of income.

Approximately 75 percent of the area is either undulating or gently rolling prairie land (Fig. 1). Level land along drainage

ways accounts for 14 percent, and the other 11 percent is either rolling or gently rolling land which was originally forested but which has been largely cleared of its native timber.

Both sheet and gully erosion are evident on most of the slopes in this area and are especially noticeable on land that was once in timber. While the most serious erosion problems are to be found on the rolling moraine and outwash areas of the county, considerable erosion is also taking place on the level and gently rolling prairie areas. (See Fig. 2.)

The continuous growing of intertilled crops — mainly corn and soybeans — without the use of needed erosion-control and fertility-improvement practices is responsible for much of the sheet and gully erosion and the resulting farm operational problems.

The following figures show the percentage of land in McLean county that is level or sloping and the percentage with different degrees of productivity:

	Percent		Percent
Land level (0 to 2 percent slope).....	63	Land highly productive.....	58
Slope of 2 to 7 percent.....	32	Land moderately productive.....	40
Slope of 7 percent and over.....	5	Productively low.....	2

Based on data from "Wartime Farm Production Adjustments in Illinois: Summaries by type of farming areas." Ill. Agr. Exp. Sta. AE1884-1894. 1942. (Mimeograph)

**Madison and St. Clair counties.** The second conservation study, undertaken in 1939, was located in Madison and St. Clair counties



Erosion scenes such as this can be prevented by contour farming, proper land use and fertilization, and other needed conservation practices. (Fig. 2)



This concrete "Missouri type" formless flume is at the end of a grass waterway which drains terraces on a contour-farmed field in St. Clair county. This rolling to level land is typical of St. Clair and Madison counties. (Fig. 3)

in the wheat, dairy, and poultry area of southwestern Illinois. These counties are in the heart of the St. Louis milkshed.

Fertility improvement, erosion control, and drainage are the major conservation problems in this area (Fig. 3). The topography varies from level Mississippi river bottomland on the west side of these two counties to steep bluffs at the inner edge of the bottomland. Many of the steep slopes are covered with a deep deposit of highly productive loess. Toward the east side of the counties the land is rolling to level. These more level upland and terrace soils have little or no surface drainage and the subsoil is only slowly permeable, with the result that the soil is likely to stay wet late in the spring.

Most of the farmers are thrifty operators of German ancestry. They were among the first in the state to apply limestone in large quantities to their land and to grow alfalfa.

This area is more subject to severe erosion damage than the northern part of the state, having somewhat heavier and more intense rainfall and fewer freezing periods in the winter. It has the advantage of a longer growing season of about 185 days.

The soil types in Madison and St. Clair counties are many, and they vary greatly in productive capacity. The following figures show the percentage of the land that is level or sloping and the percentage with different degrees of productivity:

	Percent	Percent
Land level (0 to 2 percent slope).....	47	Land highly productive.....
Slope of 2 to 7 percent.....	36	Land moderately productive.....
Slope of 7 percent and over.....	17	Productively low.....

Based on data from "Wartime Farm Production Adjustments in Illinois: Summaries by type of farming areas." Ill. Agr. Exp. Sta. AE1884-1894. Urbana, 1942. (Mimeograph)

**Stephenson, Jo Daviess, Winnebago counties.** In 1940 the long-time conservation study was started in these three counties, located in northwestern Illinois in the area of mixed livestock production. Practically all the crops grown are fed to dairy cattle, beef cattle, hogs, and sheep, although poultry is an important enterprise on many farms. Many farmers use more feed than they grow. About one-fifth of the crops sold from farms is sold to other farmers in the same area.

On most farms there is considerable land that cannot be tilled because of its rolling character. On those farms where most of the land is tillable, hogs are often the only important class of livestock. Practically a third of the farmland is used for pasture. About equal amounts are used for hay, corn, and small grains. The predominance of livestock farming is indicated by the fact that less than 2 percent of the farms are "cash-grain" farms, that is, sell more than 40 percent of their produce in the form of grain crops.

The farmland in these counties varies from gently to steeply rolling, particularly in the unglaciated area of Jo Daviess county (Fig. 4). From the standpoint of soil conservation the serious problem is how to



These adjoining farms in Jo Daviess county all follow complete conservation plans particularly adapted to unglaciated areas. (Fig. 4)

control sheet and gully erosion. The percentage of land on different degrees of slope, and the percentage with different degrees of productivity is shown here:

	Percent		Percent
Land level (0 to 2 percent slope).....	19	Land highly productive.....	15
Slope of 2 to 7 percent.....	41	Land moderately productive.....	59
Slope of 7 to 15 percent.....	19	Productively low.....	26
Slope of 15 percent and over.....	21		

Based on data from "Wartime Farm Production Adjustments in Illinois: Summaries by type of farming areas." Ill. Agr. Exp. Sta. AE1884-1894. Urbana, 1942. (Mimeograph)

Many of the soils of this area are underlain with limestone rock. Where the topsoil covering is fairly deep, the soils are, for the most part, highly productive. Contour farming and strip cropping lend themselves very well to the lay of the land and produce excellent results.

## Ten-Year Comparison of High and Low Farms

Both the high- and low-conservation farms were under the management of Illinois account-keepers and survey-record cooperators, and even the low farms were probably better managed and had more conservation practices in effect than the average farms in their areas. The owners and operators of the high farms, however, had invested more capital in land improvements than the owners and operators of the low farms. Also they had more nearly met the needs of the soil for minerals, such as limestone, phosphate, and potash, and had used more water-disposal measures, such as contouring, terracing, grass waterways, and more pasture-improvement practices.

**Changes in size of farms.** In two of the three areas studied, both the high- and the low-conservation farms increased in size during the ten years. In McLean county the high-conservation farms increased from 193 acres to 281 acres (Table 1). The low-conservation farms increased from 189 acres to 261 acres. For the ten years the high farms averaged 23 acres more than the low farms.

In Madison and St. Clair counties the high-conservation farms increased 29 acres in size during the ten-year period; but the low-conservation farms shrank 8 acres. In Stephenson, Jo Daviess, and Winnebago counties the high conservation farms increased 73 acres, the low-conservation farms, 67 acres.

**How the land was used.** In the northwestern Illinois counties—Stephenson, Jo Daviess, and Winnebago—the proportion of tilled land per farm declined with increase in size of farm (Table 1). In the other two areas it remained about the same.

Both the high- and the low-conservation farms stepped up their acreages of corn and soybeans during the war years and maintained the higher acreage after the war. But the low-conservation farms continued to crop their land harder than the high-conservation farms. The acreage in small grains declined somewhat during the war years. The high-conservation farms started with a higher percent of their tilled land in hay and pasture than the low-conservation farms and

**Table 1. — Land Use on High- and Low-Conservation Farms in Three Areas of Illinois**

Area and period	Acres in farm	Percent of farm tilled	Percent of tilled land in—			
			Corn and soy- beans	Small grain	Hay and pasture	Other crops and idle
<b>McLean county</b>						
20 high-conservation farms						
2-year average, '36-37.....	193	91	47	21	27	5
2-year average, '40-41.....	224	91	42	20	34	4
2-year average, '44-45.....	281	93	53	22	24	1
10-year average, '36-45.....	231	92	49	21	27	3
20 low-conservation farms						
2-year average, '36-37.....	189	89	59	28	12	1
2-year average, '40-41.....	214	94	47	22	27	4
2-year average, '44-45.....	261	93	57	22	19	2
10-year average, '36-45.....	208	93	52	24	22	2
<b>Madison and St. Clair counties</b>						
25 high-conservation farms						
2-year average, '39-40.....	180	83	20	32	36	12
2-year average, '43-44.....	195	85	29	31	34	6
2-year average, '47-48.....	209	84	36	31	31	2
10-year average, '39-48.....	195	84	28	31	34	7
25 low-conservation farms						
2-year average, '39-40.....	204	81	24	35	27	14
2-year average, '43-44.....	205	84	32	30	31	7
2-year average, '47-48.....	196	84	38	28	29	5
10-year average, '39-48.....	201	82	32	31	29	8
<b>Stephenson, Jo Daviess, Winnebago counties</b>						
35 high-conservation farms						
2-year average, '40-41.....	156	83	26	20	49	5
2-year average, '44-45.....	215	75	34	23	42	1
2-year average, '48-49.....	229	70	34	24	42	0
10-year average, '40-49.....	204	77	32	23	44	1
35 low-conservation farms						
2-year average, '40-41.....	157	83	28	24	45	3
2-year average, '44-45.....	222	76	35	25	38	2
2-year average, '48-49.....	224	70	36	26	38	0
10-year average, '40-49.....	208	78	35	25	39	1

continued to grow more hay and pasture (legumes and grasses) throughout the ten-year period. Acreages of hay and pasture were reduced during the war years, but the use of limestone and fertilizers was increased.

The high-conservation farms had a higher proportion of their hay and pasture in deep-rooted legumes such as alfalfa and sweet clover. The better soil treatment applied by these farmers enabled them to get better stands of the more desirable legumes and grasses and also to grow better legume catch crops after the small grain. Their greater use of contouring, strip-cropping, terraces, grass waterways, and buffer strips made it possible for them to grow more cultivated crops than were grown on the low-conservation farms, without incurring serious erosion losses.

In each of the three areas the high-conservation farmers reduced the percent of their tillable land in "other crops and idle land" over the ten-year period. ("Other crops" are those other than corn, soybeans, oats, and wheat.)

The high-conservation farmers had more of their tillable land in hay and pasture than the low-conservation farmers: in McLean county 27 percent compared with 22 percent; in the Madison-St. Clair area 34 percent compared with 29 percent; in Stephenson, Jo Daviess, and Winnebago counties 44 percent compared with 39 percent. Although these differences are not great, it is significant that they are so consistent; in each area the high-conservation farmers had, for each 100 acres of land, 5 more acres in hay and pasture than the low-conservation farmers.

**Crop yields.** At the middle of the ten-year period the yields of corn on the high-conservation farms showed either a greater increase or a smaller decrease than on the low-conservation farms (Table 2).

During the last two years of the ten-year period the high-conservation farms showed substantial increases in yields. In McLean county the corn yields during these years averaged 7 bushels more an acre on the high-conservation farms than on the low, and the crop-yield index averaged 13 points higher. In Madison-St. Clair counties corn yields were 5 bushels higher and the crop index 8 points higher.<sup>1</sup> In Stephenson, Jo Daviess, and Winnebago counties the differences were 8 bushels of corn, 6 bushels of oats, and 13 points on the crop index in favor of the high-conservation farms.

<sup>1</sup> At the beginning of the study the low-conservation farms were showing higher yields than the high-conservation farms. Thus the higher yields on the high-conservation farms at the end of the ten years take on added significance.

**Table 2.—Crop Yields on High- and Low-Conservation Farms in Three Areas of Illinois**

Area and period	Corn	Soy-beans	Oats	Wheat	Crop-yield index <sup>a</sup>
<b>McLean county</b>					
20 high-conservation farms					<i>Bushels per acre</i>
2-year average, '36-37.....	39	17	39	..	92
2-year average, '40-41.....	57	21	50	..	105
2-year average, '44-45.....	59	25	44	..	112
10-year average, '36-45.....	56	23	41	..	106
20 low-conservation farms					
2-year average, '36-37.....	40	17	39	..	94
2-year average, '40-41.....	52	20	47	..	98
2-year average, '44-45.....	52	22	40	..	99
10-year average, '36-45.....	51	21	39	..	100
<b>Madison and St. Clair counties</b>					
25 high-conservation farms					
2-year average, '39-40.....	53	20	37	25	107
2-year average, '43-44.....	43	19	25	22	106
2-year average, '47-48.....	49	21	32	26	110
10-year average, '39-48.....	49	20	37	24	109
25 low-conservation farms					
2-year average, '39-40.....	57	16	38	26	113
2-year average, '43-44.....	44	18	26	20	104
2-year average, '47-48.....	44	20	30	23	102
10-year average, '39-48.....	46	18	36	21	105
<b>Stephenson, Jo Daviess, Winnebago counties</b>					
35 high-conservation farms					
2-year average, '40-41.....	69	22	47	..	106
2-year average, '44-45.....	55	25	52	..	109
2-year average, '48-49.....	76	22	57	..	115
10-year average, '40-49.....	68	23	51	..	113
35 low-conservation farms					
2-year average, '40-41.....	68	22	48	..	106
2-year average, '44-45.....	49	22	49	..	101
2-year average, '48-49.....	68	24	51	..	102
10-year average, '40-49.....	62	18	47	..	104

<sup>a</sup> Average yields of all farms in the counties equals 100, from Illinois Cooperative Crop and Livestock Statistics.

As explained in the footnote to Table 2, the crop-yield index is an expression of the yields of these farms relative to the average yields of the counties where they are located. Over the ten years of the study this index shows that yields on the high-conservation farms improved relative to the average of the county, while those on the low-conservation farms, except in McLean county, declined. For the ten-year period in McLean county the corn yields on the high-conservation farms averaged 5 bushels an acre higher than on the low-conservation farms, in Madison and St. Clair counties 3 bushels higher, and in

Stephenson, Jo Daviess, and Winnebago counties 6 bushels higher. In McLean county the crop-yield index for the ten years was 6 points higher on the high-conservation farms than on the low, in Madison and St. Clair counties 4 points higher, and in Stephenson, Jo Daviess, and Winnebago counties 9 points higher.

**Amount and efficiency of livestock.** In McLean county livestock production increased greatly on both high- and low-conservation farms during the ten years. High farms showed greater gains in meat production; low farms, in milk production (Table 3).

On the high farms \$5.19 more feed per acre per year was fed to

**Table 3.—Amount and Efficiency of Livestock on High- and Low-Conservation Farms in Three Areas of Illinois**

(Dollar values are adjusted to 1945 price level)

Area and period	Annual production per acre of farm		Value of feed fed per acre per year	Returns per \$100 of feed fed	Share of farm income from livestock
	Meat	Milk			
<b>McLean county</b>					
20 high-conservation farms					perct.
2-year average, '36-37.....	76	72	\$ 9.26	\$173	49
2-year average, '40-41.....	132	140	19.18	142	58
2-year average, '44-45.....	259	86	25.63	135	64
10-year average, '36-45.....	155	102	20.80	137	59
20 low-conservation farms					
2-year average, '36-37.....	63	56	\$ 4.97	\$174	31
2-year average, '40-41.....	101	108	10.12	142	35
2-year average, '44-45.....	181	188	23.90	129	62
10-year average, '36-45.....	116	132	15.61	134	48
<b>Madison and St. Clair counties</b>					
25 high-conservation farms					
2-year average, '39-40.....	87	451	\$17.24	\$170	64
2-year average, '43-44.....	108	527	22.89	174	84
2-year average, '47-48.....	83	416	14.71	205	72
10-year average, '39-48.....	96	491	18.35	196	76
25 low-conservation farms					
2-year average, '39-40.....	83	321	\$15.96	\$142	61
2-year average, '43-44.....	92	341	20.22	149	78
2-year average, '47-48.....	94	319	16.98	177	77
10-year average, '39-48.....	91	346	18.12	166	76
<b>Stephenson, Jo Daviess, Winnebago counties</b>					
35 high-conservation farms					
2-year average, '40-41.....	233	731	\$37.51	\$148	90
2-year average, '44-45.....	220	603	33.41	162	93
2-year average, '48-49.....	231	736	35.85	135	96
10-year average, '40-49.....	229	667	35.80	149	92
35 low-conservation farms					
2-year average, '40-41.....	187	628	\$28.85	\$162	89
2-year average, '44-45.....	185	620	31.40	155	93
2-year average, '48-49.....	193	550	30.05	130	97
10-year average, '40-49.....	182	556	30.10	144	93

productive livestock, and the returns per \$100's worth of feed fed averaged \$3 more than on the low farms. Livestock supplied 59 percent of the farm income compared with 48 percent on the low farms.

In the Madison-St. Clair county area both the high- and the low-conservation farms increased their meat and milk production during the war years, and reduced milk production in the two post-war years, 1947-1948. For the ten-year period the high-conservation farms produced an average of 5 pounds more meat and 145 pounds more milk (on 3.5-percent butterfat basis) per acre per year.

The high farms fed only 23 cents more feed per acre to livestock each year but averaged \$30 more in returns per \$100 of feed fed. In both groups livestock furnished the same share of the farm income.

In Stephenson, Jo Daviess, and Winnebago counties meat production averaged 47 pounds an acre more and milk averaged 111 pounds an acre more on the high-conservation farms than on the low. The high farms fed \$5.70 more feed per acre and had an average of \$5.00 more returns for \$100's worth of feed fed than the low farms.

In McLean, Madison, and St. Clair counties, on both the high- and the low-conservation farms, livestock production increased per acre along with an increase in acres per farm. In Stephenson, Jo Daviess, and Winnebago counties the livestock production increased substantially per tilled acre in the farm. On the high-conservation farms the higher returns for \$100's worth of feed fed, as well as the higher livestock production per acre, were due in part to increase in acreage of legumes and grasses and better quality hay and pasture produced as a result of the soil-improvement program (Fig. 5).



Here a high-producing dairy herd makes good use of a legume-grass mixture grown in rotation for fertility improvement and erosion control. (Fig. 5)

**Farm expense.** In each of the three areas, conservation expenses per acre (including limestone, phosphate, mixed fertilizers, legume and grass seeding, terraces, grass waterways, and erosion-control structures) averaged significantly higher on the high-conservation farms (Table 4). In McLean county at the start of the ten-year period the high-conservation farmers incurred an average conservation expense of \$2.78 an acre a year, compared with \$1.02 spent by the low-conservation farmers. At the end of the ten-year period the low-conservation farmers were doing more toward improving their

**Table 4. — Farm Expenses on High- and Low-Conservation Farms in Three Areas of Illinois**

(Dollar values are adjusted to 1945 price level)

Area and period	Conserva- tion expense per acre	Labor, power, and machinery expense per crop acre	Total farm expense per acre
<b>McLean county</b>			
20 <i>high</i> -conservation farms			
2-year average, '36-37.....	\$ 2.78	\$16.98	\$19.31
2-year average, '40-41.....	1.24	17.36	16.71
2-year average, '44-45.....	1.88	21.12	26.72
10-year average, '36-45.....	1.77	19.36	21.62
20 <i>low</i> -conservation farms			
2-year average, '36-37.....	\$1.02	\$13.53	\$16.63
2-year average, '40-41.....	1.24	16.49	17.26
2-year average, '44-45.....	1.61	23.16	27.59
10-year average, '36-45.....	1.24	19.59	21.48
<b>Madison and St. Clair counties</b>			
25 <i>high</i> -conservation farms			
2-year average, '39-40.....	\$1.56	\$18.90	\$20.26
2-year average, '43-44.....	2.46	27.93	28.74
2-year average, '47-48.....	3.44	26.46	24.45
10-year average, '39-48.....	2.74	26.25	22.87
25 <i>low</i> -conservation farms			
2-year average, '39-40.....	\$1.18	\$18.81	\$15.35
2-year average, '43-44.....	1.85	29.38	24.87
2-year average, '47-48.....	2.61	29.06	27.04
10-year average, '39-48.....	1.98	27.24	22.74
<b>Stephenson, Jo Daviess, Winnebago counties</b>			
35 <i>high</i> -conservation farms			
2-year average, '40-41.....	\$1.79	\$25.97	\$26.33
2-year average, '44-45.....	1.48	36.27	26.15
2-year average, '48-49.....	1.61	41.57	31.07
10-year average, '40-49.....	1.79	36.86	34.46
35 <i>low</i> -conservation farms			
2-year average, '40-41.....	\$ .84	\$23.70	\$22.11
2-year average, '44-45.....	1.12	37.80	26.84
2-year average, '48-49.....	1.22	37.81	27.85
10-year average, '40-49.....	.90	34.62	27.57

land and were spending almost as much for conservation as the high-conservation farmers. For the ten years, however, the high-conservation farmers spent 53 cents an acre a year more on conservation and fertility improvement. In Madison and St. Clair counties the high-conservation farmers spent substantially more for conservation expenses throughout the period than the low-conservation farmers, averaging 76 cents an acre a year more. The same was true for Stephenson, Jo Daviess, and Winnebago counties, where expenses for conservation averaged 89 cents an acre more on the high-conservation farms than on the low. However, the low-conservation farmers had materially increased their expenditures for soil conservation during the ten-year period.

In each of the three areas, labor, power, and machinery costs increased during the ten-year period even though expressed in terms of the same dollar value. Part of the increase is undoubtedly due to the fact that more of the items of expenditure were cash outlays than they were at the start of the ten years. The increase in livestock production would be responsible for a considerable part of the increase in operating costs, both on the high- and the low-conservation farms.

In McLean county and in Madison and St. Clair counties, labor, power, and machinery costs increased more on the low-conservation farms than on the high. In Stephenson, Jo Daviess, and Winnebago counties these costs increased on the high-conservation farms, but the increase was about in proportion to the increase in the volume of livestock produced.

There was very little difference in total farm-operating expenses per acre between the high- and low-conservation farms in McLean county and Madison-St. Clair counties. These expenses were slightly higher at the end of the period on the low farms. In Stephenson, Jo Daviess, and Winnebago counties total expenses were somewhat higher on the high-conservation farms. Here again the increase was about in proportion to the volume of feed fed to livestock.

That the conservation practices on the high-conservation farms were not responsible for the higher operating expenses on those farms is indicated by studies of the cost of farming on the contour and by the usual field arrangement. The increases in the amount of livestock produced account for the differences.

The trend toward higher operating costs is in keeping with the current over-all agricultural trend.

**Farm income.** Looking first at the total gross income (total receipts plus inventory increases), we find that in each area the high-

conservation farms led the low-conservation farms (Table 5). On all groups of farms in all three areas, there was an increase in the gross income from livestock. The gross income from crops increased in McLean county and in Madison and St. Clair counties; but in Stephenson, Jo Daviess, and Winnebago counties, the increase in livestock feeding reduced the gross income from crops.

The "pay-off," however, for the effort that goes into conservation plans and better management is shown by the net return an operator

**Table 5. — Income From High- and Low-Conservation Farms in Three Areas of Illinois**

(Dollar values are adjusted to 1945 price level)

Area and period	Receipts and inventory increases per farm				Net returns for capital and management	
	Live-stock	Crops	Other	Total	Total farm	Per acre
<b>McLean county</b>						
20 <i>high</i> -conservation farms						
2-year average, '36-37...	\$ 3,023	\$ 2,714	\$ 304	\$ 6,041	\$ 2,315	\$11.99
2-year average, '40-41...	5,936	3,582	161	9,679	5,936	26.50
2-year average, '44-45...	9,315	4,512	740	14,567	7,060	25.12
10-year average, '36-45...	6,421	3,809	352	10,582	5,588	24.19
20 <i>low</i> -conservation farms						
2-year average, '36-37...	\$ 1,643	\$ 3,074	\$ 477	\$ 5,194	\$ 2,050	\$10.85
2-year average, '40-41...	3,174	5,170	177	8,521	4,828	22.56
2-year average, '44-45...	7,684	4,090	634	12,408	5,207	19.95
10-year average, '36-45...	4,211	3,948	348	8,507	4,039	19.42
<b>Madison and St. Clair counties</b>						
25 <i>high</i> -conservation farms						
2-year average, '39-40...	\$ 4,014	\$ 1,262	\$ 1,013	\$ 6,289	\$ 2,642	\$14.68
2-year average, '43-44...	6,982	588	790	8,360	2,755	14.13
2-year average, '47-48...	6,925	2,193	561	9,679	4,564	21.86
10-year average, '39-48...	6,230	1,225	686	8,141	3,688	18.88
25 <i>low</i> -conservation farms						
2-year average, '39-40...	\$ 3,521	\$ 1,384	\$ 856	\$ 5,761	\$ 2,623	\$12.89
2-year average, '43-44...	5,514	812	771	7,097	1,997	9.75
2-year average, '47-48...	6,267	1,393	498	8,158	2,853	14.58
10-year average, '39-48...	5,289	1,052	621	6,962	2,397	11.90
<b>Stephenson, Jo Daviess, Winnebago counties</b>						
35 <i>high</i> -conservation farms						
2-year average, '40-41...	\$ 8,017	\$ 374	\$ 578	\$ 8,969	\$ 4,862	\$31.16
2-year average, '44-45...	9,629	472	176	10,277	4,655	21.65
2-year average, '48-49...	12,430	-1,122	366	11,674	4,559	19.91
10-year average, '40-49...	11,217	638	475	12,330	5,304	25.98
35 <i>low</i> -conservation farms						
2-year average, '40-41...	\$ 7,107	\$ 495	\$ 403	\$ 8,005	\$ 4,533	\$28.87
2-year average, '44-45...	8,987	444	91	9,522	3,563	16.05
2-year average, '48-49...	9,860	-723	206	9,343	3,105	13.86
10-year average, '40-49...	9,330	172	304	9,806	4,069	19.57

gets for his capital and management. The last two columns in Table 5 show what this was for each of the three areas.

Because the size of the farms increased during the ten years of the study, the net acre return (last column in Table 5) is the best measure of the value of the improved farm program. In McLean county this figure was \$1.14 a year higher on the high-conservation farms than on the low farms at the start of the ten years and \$5.17 higher at the end. In Madison and St. Clair counties the high-conservation farms averaged \$1.79 more at the start and \$7.28 more at the end. Figures for Stephenson, Jo Daviess, and Winnebago counties were \$2.29 more at the start and \$6.05 more at the end. For the entire period the high-conservation farms averaged higher net earnings by \$4.77 an acre in McLean county, \$6.98 in Madison-St. Clair counties, and \$6.41 in Stephenson, Jo Daviess, and Winnebago counties.

Capitalizing these higher returns at 5 percent would raise the earning value of the land \$95, \$139, and \$128 an acre respectively.

Thus the high-conservation farmers in all three areas were forging far ahead of the low-conservation farmers in the profitability of their operations. And furthermore the soils on the high-conservation farms have a higher reserve of productivity because they are better managed.

## Benefits From Contour Farming

**Crop yields are increased.** Contouring, contour strip-cropping, use of grass waterways, and terracing are among the most widely used devices for conserving soil and water. Contouring prevents runoff of most of the rainfall, thus keeping it for plant growth. The eroding away of soil and of fertility elements is also greatly retarded.

To measure the effects of the above practices, yields of crops grown on the contour, in contour strips, or on terraced fields on the contour were compared with those of the same crops grown on the same farms up and down hill or in the usual field pattern. In so far as is possible, this comparison eliminates differences in management and in practices other than contouring. Yield results for a seven-year period were as follows:

Crop	Number of farms	Yield increases from contouring <sup>a</sup>		
		Percent	Bushels an acre	Value
Corn.....	124	12	6.9	\$7.38
Soybeans.....	48	13	2.7	\$5.64
Oats.....	46	16	6.9	\$4.69
Wheat.....	40	17	3.4	\$5.37

<sup>a</sup> (Average of seven years, 1939-1945, adjusted to 1945 Illinois farm prices: corn \$1.07 a bushel, soybeans \$2.09, oats 68 cents, wheat \$1.58)



Contour farming on the rolling land of central Illinois reduces or prevents soil and water erosion losses, permits more intensive land use, and increases corn and soybean yields. (Fig. 6)

Thus the farmers who contour-farmed their sloping land increased their production as much as though they had put 12 percent more land in corn, 13 percent more in soybeans, 16 percent more in oats, and 17 percent more in wheat. Since the contoured fields were usually those parts of a farm most subject to severe erosion and soil deterioration, these increases are even more significant than they appear.

**Expenses not increased.** The effect of contour-farming on total costs of operating the farm was studied on 270 Illinois accounting farms for the four years 1940-1943. Farms where all or most of the operations were on the contour were matched with comparable farms where few, if any, operations were on the contour, with the following results:

	<i>Costs per crop acre<sup>a</sup></i>	
	<i>135 farms tilled on contour</i>	<i>135 farms not tilled on contour</i>
Man labor costs.....	\$14.71	\$15.81
Power and machinery costs.....	9.79	10.27
Total.....	\$24.50	\$26.08
Difference in favor of contouring.....	\$ 1.58	....

<sup>a</sup> (Average of four years 1940-1943, with costs adjusted to 1945 price level)

The small difference in total expenses for labor, power, and machinery favored contour farming. This is what might be expected since the more uniform pull of a tractor following the contour of a sloping field would be expected to lead to more economical use of power than when the tractor travels up and down the slope.

With our need for high food production and the large acreages

now planted to intertilled crops, it is especially urgent that our soil and water resources be safeguarded by the maximum use of soil-conservation and erosion-control practices. Farming on the contour is relatively easy, calls for little or no outlay of capital, and brings better crop yields. Usually it does not increase operating expenses, but actually reduces them.

## Findings on the Economics of Soil Conservation

These long-time studies of high- and low-conservation farms have shown that soil conservation adds to the long-time value of farmland, based on its producing ability.

In all three areas the high-conservation farmers tended to change their plans from year to year as they found that a more complete program was needed. Some found it necessary to establish more or wider grass waterways. Some found it desirable to contour more of the cropland or to add terraces to certain fields.

**Capital outlays.** The adoption of a conservation program involves some capital expenditures. These averaged approximately \$35 an acre for the high-conservation farms. Included were outlays for limestone, phosphate, potash, and other fertilizer materials plus the out-of-pocket costs for terracing, waterways, structures, and other conservation investments.

**Tenure and conservation.** Tenure problems appear to be one of the major stumbling blocks to the adoption of conservation plans in the corn belt. Because of the kinds of rental agreements in general use, changes in farm organization, such as shifting land to hay and



This wide grass waterway in a contour-planted field in McLean county was formerly a gully. Now it produces a good crop of hay. (Fig. 7)

pasture and increasing livestock numbers to utilize the roughage produced, are harder to make on tenant farms. When livestock share leases are adopted, the interests of landlord and tenant become more nearly identical, and the livestock program can be made to fit into the general conservation plan of the farm. If landlords were to realize more generally how the acre-yields of grain crops on their farms could be increased by the growing of more grasses and legumes and more livestock, there would be a much wider and faster adoption of soil-conservation practices in the state.

If tenants and landlords now operating on a crop-share cash lease cannot agree on joint ownership of livestock or on a shift to a livestock-share lease, there are alternative plans that they might use when a tenant wishes to raise livestock:

1. The tenant might pay a periodic rental (monthly or otherwise) to the landlord to reimburse him for expenses incurred in providing and maintaining buildings and other improvements for livestock.

2. The tenant might provide the improvements necessary for livestock, stipulation being made in the lease that if he moved he would be reimbursed for the unexhausted value of such improvements.

3. The tenant might be willing to pay a higher-than-normal cash rental for additional land seeded to grass and legumes because it would enable him to keep more livestock.

**Grain farming and conservation.** Grain farmers not interested in livestock production will find it profitable to step up crop yields with intensive applications of fertilizer and to use rotations that will help to control erosion and build up organic matter in the soil. Men who do not have the skills needed to handle livestock should not be encouraged to go into its production. To get more profit from their legume and grass areas they might specialize in seed production. Also by making full use of water-disposal and erosion-control practices they can safely crop their land more intensively than they otherwise could.

**Time required to realize conservation benefits.** Studies in different parts of Illinois show that money spent on conservation is a sound investment, resulting in higher net income in one to four years, depending on the extent of the farm's conservation needs. Returns from such investments are a safe basis for the credit often needed for establishing a conservation program. Although net income may be temporarily reduced, the productive value of the land increases im-



Farm ponds, properly engineered and managed, help to control erosion and store water for livestock and irrigation. A well-managed pond also affords opportunities for fishing, swimming, boating, and other recreation and provides habitat for game and songbirds. A farm pond in Illinois costs from \$200 to \$300 and up, depending on size and amount of work done by farm labor. The value of the pond as a source of cool, clear water (piped to tanks) is usually much greater than the cost. (Fig. 8)

mediately, thus protecting the financial position of the landowner until the long-time benefits of his investment accrue.

In each of the three areas included in this study, the differences in crop yields, livestock production, and net income between the high- and low-conservation farms are becoming wider as time goes on. Production on the high farms is increasing relative to that on the low farms. In years of adverse weather the yield and production differences between the high and low farms have been even more pronounced than in years of favorable weather. In wet years the high farms, with more abundant and better-quality hay and pasture, have produced more livestock and have not been affected so adversely by the weather. In dry years they have not "burned up" as rapidly as the low-conservation farms.

On many farms, buildings, fences, livestock equipment, livestock water supplies, and other improvements had to be provided in order to care for the additional livestock needed to utilize the roughages

produced under the conservation plan. Machinery for harvesting hay and forage was required when the acreage and production of forage crops were increased.

In addition to cash outlays for their soil-conservation programs, the high-conservation farmers usually put in considerable labor and machine work on terraces, waterways, contouring, fence moving, etc., for which there was no direct cash outlay.

**Improved management.** In general, the high-conservation farmers managed all phases of their farm businesses more efficiently than the low-conservation farmers. The records show that as they put their conservation plans into effect they also tended to improve the management of their farms. They made better use of their capital than the low-conservation farmers, both for conservation and for increased production. They increased their livestock returns by adjusting their businesses to make good use of the larger quantities and better quality of hay and pasture resulting from soil treatment and erosion control.

The more complete plans followed by the high-conservation farmers included: (1) testing and treating their soil; (2) using each piece of land according to its capabilities; (3) using rotations with ample acreages of deep-rooting legumes; and (4) using the types of water disposal best suited to their needs: grass waterways, contouring, strip-cropping, terracing, and tile and open-ditch drainage. These farmers also utilized their forage crops either as feed for livestock, for seed production, or as a green-manure crop.

A number of the high-conservation farmers demonstrated the possibility of successfully rebuilding a run-down farm. They also showed that it pays to use capital to hasten the improvement of the productive capacity of the farm.

## Summary and Conclusions

Better earnings are the measurable result of better soil-conservation and fertility-improvement practices on Illinois farms and of the generally improved management that goes along with these practices.

In the ten-year study reported here, the net earnings of a group of high-conservation farms in McLean county averaged \$4.77 an acre a year higher than those of a comparable group of low-conservation farms (based on 1945 price level). In Madison and St. Clair counties the difference was \$6.98 in favor of the high-conservation farms; and in Stephenson, Jo Daviess, and Winnebago counties it was \$6.41.

These differences in favor of the high-conservation farms occurred despite the fact that those farms had higher soil-improvement and building costs as a result of their conservation practices.

Capitalizing the above increases at 5 percent, we find that the earning value of the land on the high-conservation farms in McLean county over this ten-year period was \$95 greater than on the low-conservation farms; in Madison and St. Clair counties it was \$139 higher; and in Stephenson, Jo Daviess, and Winnebago counties it was \$128 higher.

The high-conservation farms used their resources more efficiently than the low-conservation farms. They reduced soil losses and improved the fertility of their farms by erosion-control practices, good land-use programs, and the wise use of fertilizers. Their better yields of grain and forage crops enabled them to produce more livestock than the low-conservation farms.

Livestock production, as measured by returns per \$100's worth of feed fed, was more efficient on the high-conservation farms, apparently because of the better feed supplies and better livestock management. Both crop and livestock enterprises contributed to the higher net income on the high-conservation farms.

Some of the benefits of conservation, such as yield increases from contour farming and from fertilizers, show up the first year. But increases from the application of limestone and phosphate often do not show up until the rotation has gone through a complete cycle and a crop of deep-rooted legumes has been plowed down. Although the low-conservation farms used in this comparison have adopted many conservation practices, the differences between the high- and low-conservation farms are becoming wider — the high-conservation farms are increasing their production relative to the low ones.

Erosion-control practices such as contour farming, terracing, and strip-cropping increased crop yields and reduced soil and water losses, but they did not, in general, add to farm operating costs. In many instances the improvements were made by using farm labor and machinery during slack periods.

By improving both present and future productivity, conservation practices usually increase net income in one to four years after they are started, depending on their extent and the need for them. The returns provide a safe basis for establishing credit to put the conservation program into effect.

Money spent on conservation is a sound investment.











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